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2. For bridges 100 meters but under 200 meters long: 3.5 bridge patrolmen.
3. For bridges 200 meters but under 300 meters long: 7 bridge patrolmen.
4. For bridges 300 meters or more in length: 10.5 bridge patrolmen.

The responsibility for normal maintenance operations on bridges where bridge patrolmen have not yet been stationed will be assumed by line patrolmen.

In the main, the number of bridge patrolmen stationed at the Ch'ang-ch'un Railway Bridge is based on the above table. But, since the volume of traffic over the Ch'ang-ch'un Railway is less than that of Soviet railroads, and since the majority of bridges in China must be patrolled by military personnel, fewer persons are employed for bridge patrol than the above table would indicate.

In addition to their patrol shifts, bridge patrolmen are also responsible for maintenance in a definite area. With respect to assignment of areas of responsibility, each operational section shall draw up a plan based on the amount of work to be done. The bridge patrolmen shall discuss the plan fully, to insure equitable assignment. The various operational sections may divide the whole of a given bridge into one, two or three patrol areas, in accordance with the number of personnel assigned by the Control Bureau. Within each patrol area, the bridge patrolmen will then set up a revolving patrol shift system, consisting of $3\frac{1}{2}$ patrol details.

This system, first instituted by Soviet railroads, has as its outstanding feature the fact that the alternation of shifts for day work and night work is reasonable. On the one hand, this system affords the workers plenty of rest, guarantees the workers' health, raises operational efficiency, and prevents accidents. On the other hand, it also eliminates added expenses, in keeping with the principles of economic planning. The Ch'ang-ch'un Railway has ruled that after bridge patrolmen have been on shift rotation for 12 hours, they then rest for 24 hours. After three or four such cycles, they then rest 48 hours. Each man works an average of 208 hours per month, which is a close approximation in practice to the theory of the "8-hour work system." (See appended table of bridge-patrol-shift rotation.)

Bridge patrolmen are responsible also for bridge maintenance in their own areas. Depending on actual circumstances additional bridge patrolmen may be stationed at each bridge to work during the daylight hours (8 hours per day on maintenance, usually resting on Sundays and holidays).

For example, ten patrolmen have been assigned to the No 1 Sung-hue River Bridge in the Harbin Operational Section. Seven of these men patrol the bridge in two patrol areas according to a system of $3\frac{1}{2}$ patrol details. The remaining three men work during the daylight hours. Assigned areas of responsibility are shown on the appended bridge-patrol table.

A schedule of organization and work distribution has been set by the Ch'ang-ch'un Railway to cover the following circumstances:

<u>No of Patrol Areas</u>	<u>No of Men on Patrol Rotation</u>	<u>No of Men Doing Daytime Work</u>	<u>Total No of Patrolmen</u>
3	10.5	0	10.5
2	7	3	10
2	7	2	9
2	7	1	8
2	7	0	7
1	3.5	2.5	6
1	3.5	1.5	5
1	3.5	0.5	4
1	3.5	0	3.5
1	0	1	1

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At bridges where $10\frac{1}{2}$ or $3\frac{1}{2}$ patrolmen are employed and when another bridge in the neighborhood also schedules $10\frac{1}{2}$ or $3\frac{1}{2}$ patrol personnel, then one man can alternate between the two bridges, working half a month at each bridge. Otherwise, 11 men, or four men, should be scheduled. The eleventh or fourth man, should be assigned to patrol rotation for half a month, then to daytime work for half a month.

B. List of Operations

The operations of bridge patrol personnel are divided into the following categories:

1. Traffic Control

Bridge patrolmen shall adhere to traffic control regulations. They shall show clear signals to guarantee safe passage to trains, handcars, and motorized cars.

2. Inspection Patrol

Bridge patrolmen shall carry out inspection patrols and assume responsibility for noting anything unusual, within the period designated in the bridge patrol schedule and within the bounds of their respective areas. If possible, the patrolman shall immediately repair any defect himself; otherwise, he shall immediately notify the Chief of Operations. If a patrolman discovers, on the bridge or in the line, damages sufficient to imperil the safe passage of trains, he shall immediately take proper emergency steps: he shall first do what he can, and either set up warning signals at the danger point or stand guard. At the same time, he shall immediately call for other personnel to assist him. He shall devise means of reporting the conditions of the damage to the Chief of Operations, the supervisor, and the stationmaster, in that area.

On patrol, personnel must pay attention to the following points:

a. All buildings and devices located on the line within 30 meters of the head of a bridge; bridge surface girders; piers; and condition of devices to provide for expansion and contraction. Special attention must be paid to the condition of rail joints, tie plates, spikes, bolts, and anticreepers.

b. Any sign of cracks in piers and girders, change in height of water level, river bottom, flow of water, and condition of flood waters.

c. To prevent cinders from starting a fire, check whether the ash doors on all locomotives are closed when trains pass over the bridge; make sure that all fire prevention devices and fire fighting equipment are in proper working order. On a wooden bridge or on a bridge where wooden planks are laid, see that the layer of gravel laid to prevent fire is in proper order.

d. Allow no unauthorized person to take pictures or make any survey in the vicinity of a bridge and allow no one to enter upon a bridge without a permit.

3. Maintenance Area of Responsibility

When there is no emergency or accident, the patrolman shall perform the following maintenance duties within his area of responsibility, in addition to the regular duty of inspection patrol:

a. Drive in or change spikes; tighten, change, or oil all bolts on bridges, fishplates, and anticreepers where needed.

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b. Adjust, change, or rebuild anticreepers on the line within 30 meters from the head of a bridge; repair roadbed and sides of roadbed; clean the areas surrounding signals and signs.

c. Clean rails and parts, bridge surface, and piers; remove snow and mud from stairways, etc. Also remove accumulated water in girder recesses and on the top of piers.

d. Perform other duties such as painting, repairing ties on the bridge, oiling between steel beams and ties, repairing fire-fighting equipment, etc.

4. Handling of Accidents

When an accident occurs, the patrolman shall immediately take the following steps:

a. When he hears calls for help from a line patrolman or tunnel patrolman in the neighboring areas, he shall immediately respond to the call and help the other in dispatching signals for additional aid.

b. In case of fire which the patrolman cannot extinguish himself, he shall dispatch signals for help immediately and notify the Chief of Operations and the supervisor. Also, if the fire has caused enough damage to imperil the passage of a train, he shall set up a signal to stop trains and provide additional protective measures.

c. When a portion of a train is accidentally disengaged from the main section of a train, he shall indicate such an occurrence by the proper signal. When a train is involved in an accident or overturned, he shall proceed to the place of accident, assist the trainmen in setting up signals, and have a line patrolman or some other person report the circumstances of the accident to the Chief of Operations, supervisor, and stationmaster in that area.

C. Preparing the Patrol Chart

Following the announcement of summer or winter train schedules every year, each Operational Section will prepare a patrol chart for each bridge located within its section and submit the chart to the Chief of Operation of the Control Bureau for approval. The chart must contain the area of responsibility for each patrolman, the time of each approaching passenger train, and the time schedule of patrolmen on duty. The Ch'ang-ch'un Railway has ruled that the following patrol will be performed at the bridges on its line:

1. One complete inspection patrol of each patrol area immediately before and after each passenger train has gone over the bridge.

2. One complete inspection patrol of each patrol area every 2 hours during the daylight hours. The remainder of the daylight hours will be devoted to maintenance work.

3. One complete inspection patrol every hour during the night.

4. The outgoing patrolman shall make a complete round of inspection together with the incoming patrolman before being relieved.

Besides preparing patrol charts, each Operational Section shall draw up a table of monthly bridge patrol shift rotations for each bridge according to the system of $3\frac{1}{2}$ patrol details. The Operational Section, the Branch Control Bureau, and the Control Bureau will each dispatch a man to watch the bridge patrol system in operation, to improve operations continually.

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D. Operational Rules

To achieve a complete patrol system and to assure safe passage of trains, bridge patrolmen must strictly adhere to the following rules:

1. Submitting Reports

Bridge patrolmen must submit a daily report of patrol and degree of maintenance work completed to the Chief of Operational Section.

2. Change of Patrol

To clarify the boundary of responsibility, the following rules shall be adhered to by each patrolman. The outgoing and incoming patrolmen will make a complete round of inspection together at each change of patrol. At the same time, the outgoing patrolman will report the existing condition of the bridge, and also transfer all tools and equipment to the incoming patrolman. The incoming patrolman then will inspect all tools and equipment transferred to him from the outgoing patrolman, make inquiries if necessary. When he understands all details, he shall record the necessary items in the Change of Patrol Logbook. When a patrolman is ill or unable to perform his duty, he must request leave of absence from the Chief of Operations or from the supervisor. Even though the time has arrived to change patrol, the outgoing patrolman may not leave his station until the incoming patrolman has arrived.

3. Traffic Control

To guarantee safe passage of trains, all bridge patrolmen must adhere to the following rules for traffic control on bridges: When the train, handcar, or motorized car has approached within 30 meters of the head of the bridge, the patrolman shall blow one long blast with his bugle for outbound trains, and two long blasts for inbound trains. The purpose of the bugle is to inform the engineer of the locomotive that the train is approaching a bridge, and to inform the workers on the bridge that the train is coming. To control the speed of trains on a bridge during the daylight hours, a patrolman shall stand to the left side of the track, facing the train, and display a rolled yellow flag if the train may proceed at its normal speed; he shall display an opened yellow flag if the train should proceed at reduced speed. During the night, a white light will be used for normal speed, a yellow light for reduced speed, and a red light for stop. After a handcar or motorized car has gone over the bridge, the patrolman shall change the yellow signal to red until such car has gone beyond the distance of five telephone poles or has completely disappeared.

At the approach of a train, the patrolman shall note whether the freight is secured properly, the train is operated at regulation speed, and the guard car has proper signals. When the conductor or the engineer indicates a signal, the patrolman should reply to him with a signal. If a train stops on the bridge or at the approach to the bridge, the patrolman shall make contact with the conductor or the acting conductor; after the train has gone over the bridge, the patrolman shall investigate to see if any cinders have fallen on the line, or if the bridge has been damaged.

4. Monthly Meeting

All bridge patrolmen shall attend a meeting convened by the Chief of Operations between the 26th and 28th days of each month to study the condition of the bridge, exchange experiences regarding the patrol, report accomplishments during the previous month, draw up plans for the coming month, and prepare the monthly report to the Office of Operations. On the basis of the report prepared by the Chief of Operations regarding the condition of the bridge patrol during the previous month, the Office of Operations shall submit reports on the bridge patrol operations to the Branch Control Bureau and the Control Bureau.

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Bridge Patrol Shift Rotation

<u>No 1 Patrol Area</u>			<u>No 2 Patrol Area</u>		
<u>Date</u>	<u>Man on Duty</u> <u>0700-1900 Hr</u>	<u>Man on Duty</u> <u>1900-0700 Hr</u>	<u>Date</u>	<u>Man on Duty</u> <u>0700-1900 Hr</u>	<u>Man on Duty</u> <u>1900-0700 Hr</u>
1	No 3	No 1	1	No 4	No 5
2	2	3	2	7	4
3	1	2	3	6	7
4	3	1	4	5	6
5	7	3	5	4	5
6	2	7	6	6	4
7	1	2	7	5	6
8	3	1	8	4	5
9	2	3	9	7	4
10	1	2	10	6	7
11	3	1	11	5	6
12	7	3	12	4	5
13	2	7	13	6	4
14	1	2	14	5	6
15	3	1	15	4	5
16	2	3	16	7	4
17	1	2	17	6	7
18	3	1	18	5	6
19	7	3	19	4	5
20	2	7	20	6	4
21	1	2	21	5	6
22	3	1	22	4	5
23	2	3	23	7	4
24	1	2	24	6	7
25	3	1	25	5	6
26	7	3	26	4	5
27	2	7	27	6	4
28	1	2	28	5	6
29	3	1	29	4	5
30	2	3	30	7	4
31	1	2	31	6	7

Total number of working hours per patrolman:

No 1 -- 216 hr
No 2 -- 216 hr
No 3 -- 216 hr
No 7 -- 96 hr

No 4 -- 216 hr
No 5 -- 204 hr
No 6 -- 204 hr
No 7 -- 120 hr

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